



(19)

(11) Publication number:

Generated Document.

PATENT ABSTRACTS OF JAPAN

(21) Application number: 09007242

(51) Intl. Cl.: H02J 7/24 B60R 16/04 C
9/04

(22) Application date: 20.01.97

(30) Priority:	(71) Applicant: HITACHI LTD HITACHI CAR ENG CC
(43) Date of application publication: 07.08.98	(72) Inventor: HIKITA SAKAE MASUNO KEIICHI
(84) Designated contracting states:	(74) Representative:

**(54) CHARGING GENERATOR
FOR VEHICLE**

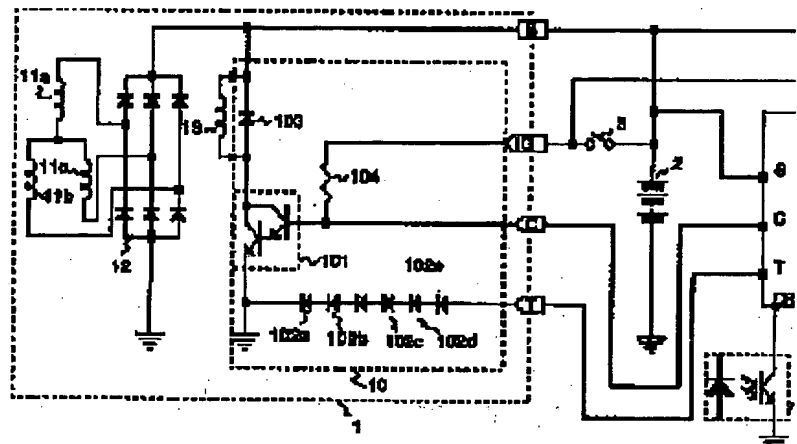
(57) Abstract:

PROBLEM TO BE SOLVED: To stabilize the rotational speed, primarily, the idling rotational speed of an engine, so as to improve the fuel consumption of the engine by deciding the generated voltage, based on the signal of the detected temperature of a generator.

SOLUTION: A generator 1 comprises a power substrate 10, armature windings 11a, 11b, and 11c of three-phase Y connection, a rectifier 12 for converting the AC output of the armature winding 11 into DC, and a field winding 13 for supplying armature windings 11a, 11b, and 11c with magnetic fluxes. Moreover, the interior of the power board is composed of a power transistor 10 Darlington-connected, diodes 102a, 102b, 102c, 102d, and 102e for detecting the temperature, a power diode 103, and a resistor 104. Then, the diodes 102a-102e are constituted of five diodes connected in series, and they

perform the control of an engine geared to the drive torque of a generator 1, by detecting the temperature of a generator 1 and performing the compensation of torque. As a result, the rotational speed, primarily the idling rotational speed of an engine is stabilized, and the fuel consumption of the engine can be improved.

COPYRIGHT: (C)1998,JPO



(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平10-210679

(43) 公開日 平成10年(1998) 8月7日

(51) Int. Cl. ⁶	識別記号	P I	
H 0 2 J 7/24		H 0 2 J 7/24	D
B 6 0 R 16/04		B 6 0 R 16/04	S
G 0 1 R 31/34		G 0 1 R 31/34	Z
H 0 2 P 9/04		H 0 2 P 9/04	M

審査請求 未請求 請求項の数 5 O L (全 7 頁)

(21) 出願番号 特願平9-7242

(22) 出願日 平成9年(1997) 1月20日

(71) 出願人 000005108

株式会社日立製作所

東京都千代田区神田駿河台四丁目6番地

(71) 出願人 000232999

株式会社日立カーエンジニアリング

312 茨城県ひたちなか市高場2477番地

(72) 発明者 引田 栄

茨城県ひたちなか市高場2477番地 株式会

社日立カーエンジニアリング内

(72) 発明者 増野 敬一

茨城県ひたちなか市大字高場2520番地 株

式会社日立製作所自動車機器事業部内

(74) 代理人 弁理士 小川 勝男

(54) 【発明の名称】 車両用充電発電装置

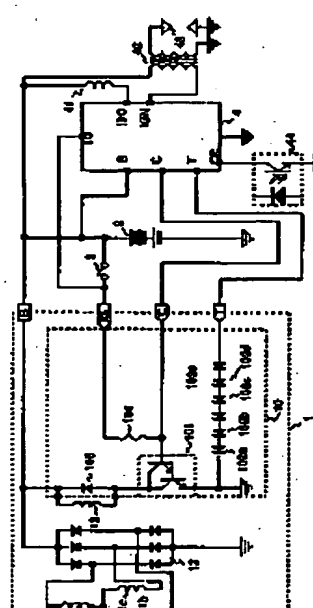
(57) 【要約】

【課題】 発電機の温度を的確に検出し、発電機の駆動トルクに応じた機関の制御を行い、機関の回転速度、主としてアイドル回転速度の安定化を図り、機関の燃費を向上させる。

【解決手段】 発電機の温度を検出する温度検出器を設け、前記温度検出器により検出された温度信号に基づき発電電圧を決定する。

【効果】 機関の回転速度、主としてアイドル回転速度の安定化を図り、機関の燃費を向上させることが可能となった。

図 1



(2)

特開平10-210679

1

【特許請求の範囲】

【請求項1】 バッテリと、該バッテリーより給電され発電に供する界磁巻線と、該界磁巻線に直列に接続され界磁電流を通電又は遮断するスイッチング手段と、発電機の外に設置され前記バッテリーの電圧を検出してその電圧に応じて前記スイッチング手段を通電または遮断する信号を生成し前記発電機の発電電圧を制御する制御装置からなる車両用充電発電装置において、前記発電電圧制御装置は検出された発電機の温度信号に基づき発電電圧を決定することを特徴とする車両用充電発電装置。

【請求項2】 請求項1記載において、前記発電機の温度信号は発電機に設けられる温度検出器から得られることを特徴とする車両用充電発電装置。

【請求項3】 機関の回転に応じて駆動されバッテリーを充電するための出力を発生する発電機と、前記バッテリーより給電され発電に供する界磁巻線と、前記界磁巻線に直列に接続され界磁電流を通電又は遮断するスイッチング手段と、前記機関の燃料供給量を制御し、かつ前記バッテリーの電圧を検出してその電圧に応じて前記スイッチング手段を通電または遮断する信号を生成し前記発電機の発電電圧を制御する制御装置とからなる車両用充電発電装置において、

前記発電機の温度を検出する温度検出器を設け、前記制御装置はスイッチング手段に与える通電信号の通電遮断比と前記温度検出器により検出された温度信号に基づき前記機関への燃料供給量を補正することを特徴とする温度検出器を内蔵したことを特徴とする車両用充電発電装置。

【請求項4】 請求項2及び3記載のいずれかにおいて、前記温度検出器は、前記スイッチング手段の近傍に設置されることを特徴とする車両用充電発電装置。

【請求項5】 請求項2、3または4記載のいずれかにおいて、前記温度検出器は、前記スイッチング手段の入力回路に直列に挿入され、前記制御装置から前記スイッチング手段へ出力する電圧をもって発電機の温度信号とすることを特徴とする車両用充電発電装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は自動車等に用いられる発電システムの改良に係り、特に機関の制御装置の中に発電制御機能を組み入れた装置の温度補償を確実に行える車両用充電発電装置に関する。

【0002】

【従来の技術】 発電機を発電機外に設置したマイクロコンピュータにより制御する方法については、特公平1-39306号公報等に述べられている。この方法では、バッテリーの温度を検出し、その温度に応じた発電量を発電させていた。

2

【発明が解決しようとする課題】 しかし、この従来技術では発電機の機械的負荷（駆動トルク）をマイクロコンピュータが検知する場合の温度補償方法については論じられていなかった。発電機の機械的負荷（駆動トルク）は、発電機自体の温度により変化し、電気負荷スイッチの動作信号により負荷状態を検出することはできるが、発電機の駆動トルクを正確に把握することができず、ヘッドライトやエアコンなどの電気負荷の投入・遮断時の回転数が安定せず（特にアイドル回転時）、場合によってはエンストのような不都合があった。

【0004】 本発明では、発電機の温度を的確に検出し、発電機の駆動トルクに応じた機関の制御を行い、機関の回転速度、主としてアイドル回転速度の安定化を図り、機関の燃費を向上させることを目的とする。

【0005】

【課題を解決するための手段】 本発明はバッテリーと、該バッテリーより給電され発電に供する界磁巻線と、該界磁巻線に直列に接続され界磁電流を通電又は遮断するスイッチング手段と、発電機の外に設置され前記バッテリーの電圧を検出してその電圧に応じて前記スイッチング手段を通電または遮断する信号を生成し前記発電機の発電電圧を制御する制御装置からなる車両用充電発電装置において、前記発電電圧制御装置は検出された発電機の温度信号に基づき発電電圧を決定することを特徴とする車両用充電発電装置によって達成される。

【0006】 本発明の好ましくは、前記発電機の温度信号は発電機に設けられる温度検出器から得られることを特徴とする車両用充電発電装置によって達成される。

【0007】 本発明は、機関の回転に応じて駆動されバッテリーを充電するための出力を発生する発電機と、前記バッテリーより給電され発電に供する界磁巻線と、前記界磁巻線に直列に接続され界磁電流を通電又は遮断するスイッチング手段と、前記機関の燃料供給量を制御し、かつ前記バッテリーの電圧を検出してその電圧に応じて前記スイッチング手段を通電または遮断する信号を生成し前記発電機の発電電圧を制御する制御装置とからなる車両用充電発電装置において、前記発電機の温度を検出する温度検出器を設け、前記制御装置はスイッチング手段に与える通電信号の通電遮断比と前記温度検出器により検出された温度信号に基づき前記機関への燃料供給量を補正することを特徴とする温度検出器を内蔵したことを特徴とする車両用充電発電装置により達成する。

【0008】 本発明の好ましくは、前記温度検出器は、前記スイッチング手段の近傍に設置されることを特徴とする車両用充電発電装置によって達成される。

【0009】 本発明の好ましくは、前記温度検出器は、前記スイッチング手段の入力回路に直列に挿入され、前記制御装置から前記スイッチング手段へ出力する電圧をもって発電機の温度信号とすることを特徴とする車両用

(3)

特開平10-210679

3

4

【0010】

【発明の実施の形態】本発明の一実施例を図1から図2で説明する。図1は本実施例による自動車用発電機及び周辺機器の回路図である。

【0011】図1の1はエンジン（図示せず）により駆動される発電機であり、パワー基板10、3相Y結線になる電機子巻線11a、11b、11c、電機子巻線11の交流出力を直流に変換する整流装置12、電機子巻線11a、11b、11cに励磁を供給する界磁巻線13から成る。2はバッテリーであり、3はキー・スイッチ、4はエンジンを制御するエンジン制御装置、41はアイドル・スピードを制御するISCバルブ、42は点火コイル、43は点火プラグである。点火コイル、点火プラグについては1気筒分を記載したが、実際には4気筒、6気筒等気筒毎に点火系を備える。

【0012】パワー基板10の内部は、ダーリントン接続されたパワー・トランジスタ101、温度を検出するダイオード102a、102b、102c、102d、102e、パワー・ダイオード103、抵抗器104より構成される。

【0013】さらに、図2にエンジン制御装置4の内部を示す。401、402は分圧抵抗器、403は5Vの定電圧を出力する定電圧回路、404は定電圧ライン(Vcc)、405は抵抗器、406はアナログ信号をデジタ

$$VT = 5 \cdot VF(T) \quad (V) \quad *$$

ここで、VFはダイオードの順方向電圧を表し、その特性の一例としては以下のような温度特性を有す。 *

$$VF = 0.65 - 0.002 \cdot (T - 25) \quad (V) \quad \dots (2)$$

ここで、T：ダイオードの温度(°C)である。(2)式★を(1)式に代入して

$$VT = 3.25 - 0.01 \cdot (T - 25) \quad (V) \quad \dots (3)$$

が得られる。得られたVTから温度Tは逆算して

$$T = 0.01 \cdot (3.25 - VT) + 25 \quad (^\circ C) \quad \dots (4)$$

で求まる。

【0017】次にステップ304で調整電圧設定値の計算を行う。一般に乗用車の車載バッテリーを充電する電圧☆

$$V_{set} = 14.4 - 0.01 \cdot (T - 20) \quad (V) \quad \dots (5)$$

の計算を行う。

【0018】次のステップ305では、出力すべき制御デューティの計算を行う。制御デューティは調整電圧設

$$D = K1 \cdot (V_{set} - V_s) + K2 \cdot \int (V_{set} - V_s) dt \quad \dots (6)$$

ここで、K1、K2はそれぞれ比例、積分定数である。

【0019】実際のデジタル演算では図3の高圧制御タ

$$D = C1 \cdot (V_{set} - V_s) + C2 \cdot D_o \quad \dots (7)$$

の式で計算すれば、(7)式は(6)式と等価になる。

【0020】(7)式で計算されたデューティは、ステップ306でトランジスタ409に伝達される。そして、C端子を介してパワー・トランジスタ101のデューティを制御する。

【0021】パワー・トランジスタ101のデューティ

＊ル値に変換するAD変換器、407は演算処理を行うMPU、408は出力バッファ回路、409はトランジスタ、410、411はパワー・トランジスタである。エンジン制御装置4はエンジンへの燃料供給量を制御し、点火時期等を制御し総合的にエンジンを電子制御する動作を行うが、本実施例では発電制御周辺の回路のみを掲載している。

【0014】以上の構成による、発電動作を次に説明する。図3は本実施例における、エンジン制御装置4の発電機に関わる部分のフローチャートを表す。一定の周期（例えば10msec.）で発電制御に関するタスクが実行される。ステップ301で電圧制御のタスクが開始されると、ステップ302へ移り、バッテリー電圧Vsを取り込む。バッテリー2の電圧Vsは、S端子を介して図2の分圧抵抗器401、402で分圧され、AD変換器406でデジタル値に変換される。この電圧値をVsとし、記憶する。次にステップ303で発電機の温度VTを取り込む。発電機のT端子には図2の定電圧ラインVccから抵抗器405を介して電流が供給される。発電機1のダイオード102a～102eは5個のダイオードを直列接続して成り、T端子の電圧VTは以下の式で表される。

【0015】

--- (1)

＊【0016】

--- (2)

--- (3)

--- (4)

☆は、常温(20°C)で14.4V、発電機の温度により-0.01V/°Cの温度補償を行うのが最適であり、

◆定値Vsetと実際のバッテリー電圧取り込み値Vsの偏差をなくすようにフィードバック制御を行う。本実施例では偏差に対してPI(比例・積分)制御を行い、

＊スクが計算した前回のDをDoとし、荷重平均により、

より電機子巻線11に発生する高圧が変わり、整流装置12を介してバッテリー2の電圧に影響を受ける。バッテリー電圧Vsは、以上に述べたソフトウェアにてフィードバック制御されており、調整電圧Vsetに調整される。この調整電圧Vsetは、発電機1内部の温度により補償され、低温時に高電圧、高温時に低電圧に設定され、バ

(5)

特開平10-210679

7

$$VT = 6 \cdot VBE$$

となり、ダイオードを6個直列接続した図1の回路と同等になる。本実施例では少ない素子で第1の実施例と等価な回路を構成できるので、経済上の効果がある。

【0032】本発明の第3の実施例を図6、図7に示す。図6の回路構成では、図1の回路図と比較してC端子とT端子を統合してT端子としている。図7は図6のエンジン制御装置4の内部回路を示す。図7では、C端子が省略され、トランジスタ409のコレクタはT端子に接続されている。本実施例によれば、パワートランジスタ101のベース電流は、IG端子から抵抗器104、ダイオード102e、102d、102c、102b、102aを通して流れる。このベース電流によりT端子には(3)式の電圧が発生する。しかし、トランジスタ409が導通状態にあるときは、T端子電圧はトランジスタ409のコレクタ・エミッタ間飽和電圧(通常0.1V以下)に抑えられ、温度Tと無関係の電圧となる。従って、AD変換器にてT端子の電圧を取り込む時は、トランジスタ409が遮断状態にある必要がある。そこで、図3のステップ303において、トランジスタ409に導通信号を出力している時取り込まれたデータは、無効データとして無視すると良い。発電機の温度は急激に変化するものではなく、10msec.の電圧制御タスク毎に取り込まれる必要はない。

【0033】本実施例によれば、発電機1及びエンジン制御装置4の端子を1本ずつ減らすことが可能であり、経済性がさらに良くなる。

【0034】本発明の第4の実施例を図8に示す。図8の10は図6のパワー基板10を置き換えた物である。

【0035】パワー基板10の内部は、ダーリントン接続されたパワー・トランジスタ101、温度を検出するト

8

...(14')

*ランジスタ105、パワー・ダイオード103、抵抗器104、106a、106bより構成される。本実施例は第2の実施例と第3の実施例を組み合わせた物であり、ダイオードの個数を低減するとともに端子の数を低減しており、経済上の最大効果が得られる組み合わせになっている。

【0036】

【発明の効果】本発明では、発電機の温度を的確に検出し、発電機の駆動トルクに応じた機関の制御を行い、機関の回転速度、主としてアイドル回転速度の安定化を図り、機関の燃費を向上させることが可能となる。

【図面の簡単な説明】

【図1】本発明の第1の実施例による自動車用発電機及び周辺機器の回路図。

【図2】図1のエンジン制御装置4の内部回路図。

【図3】第1の実施例における、エンジン制御装置4の発電機に関わる部分のフローチャート。

【図4】第1の実施例のアイドル回転数を補正するタスクのフローチャート。

【図5】本発明の第2の実施例によるパワー基板10の内部回路図。

【図6】本発明の第3の実施例による自動車用発電機及び周辺機器の回路図。

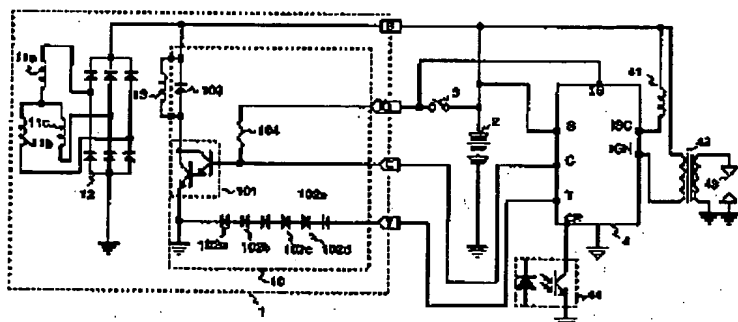
【図7】図6のエンジン制御装置4の内部回路図。

【図8】本発明の第4の実施例によるパワー基板10の内部回路図。

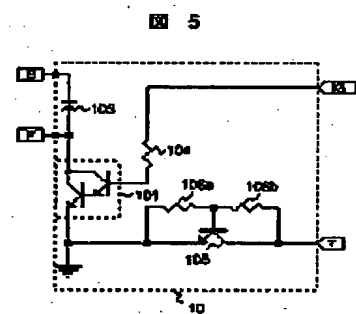
【符号の説明】

4...エンジン制御装置、10...パワー基板、41...ISCバルブ、102a、102b、102c、102d、102e...ダイオード、406...AD変換器。

【図1】



【図5】



(6)

特開平10-210679

【図2】

【図3】

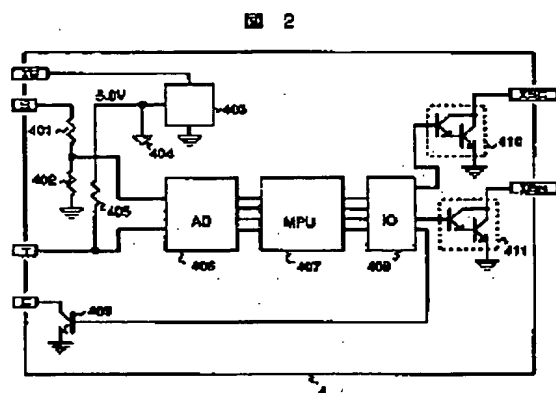
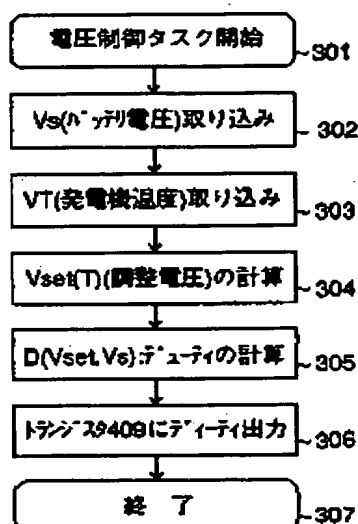
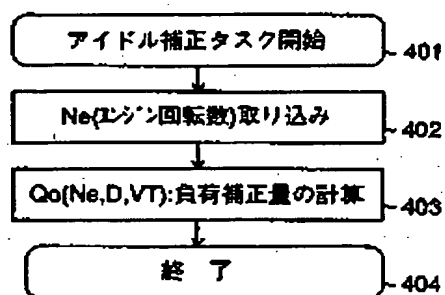


図 3

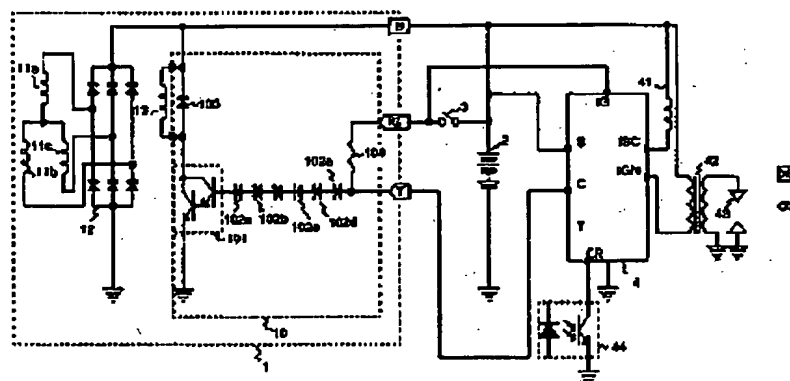


【図4】

図 4



【図6】

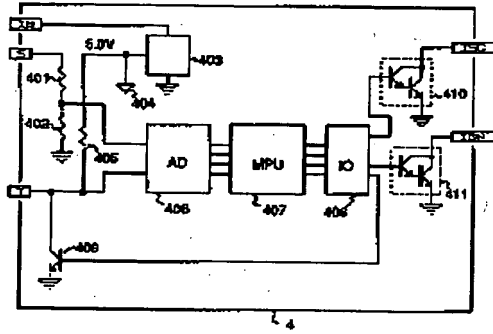


(7)

特開平10-210679

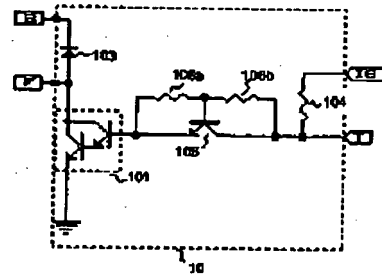
【図7】

図 7



【図8】

図 8



PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-210679

(43)Date of publication of application : 07.08.1998

(51)Int.Cl.

H02J 7/24
B60R 16/04
G01R 31/34
H02P 9/04

(21)Application number : 09-007242

(71)Applicant : HITACHI LTD
HITACHI CAR ENG CO LTD

(22)Date of filing : 20.01.1997

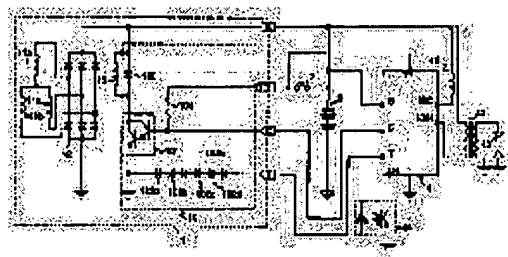
(72)Inventor : HIKITA SAKAE
MASUNO KEIICHI

(54) CHARGING GENERATOR FOR VEHICLE

(57)Abstract:

PROBLEM TO BE SOLVED: To stabilize the rotational speed, primarily, the idling rotational speed of an engine, so as to improve the fuel consumption of the engine by deciding the generated voltage, based on the signal of the detected temperature of a generator.

SOLUTION: A generator 1 comprises a power substrate 10, armature windings 11a, 11b, and 11c of three-phase Y connection, a rectifier 12 for converting the AC output of the armature winding 11 into DC, and a field winding 13 for supplying armature windings 11a, 11b, and 11c with magnetic fluxes. Moreover, the interior of the power board is composed of a power transistor 10 Darlington-connected, diodes 102a, 102b, 102c, 102d, and 102e for detecting the temperature, a power diode 103, and a resistor 104. Then, the diodes 102a-102e are constituted of five diodes connected in series, and they perform the control of an engine geared to the drive torque of a generator 1, by detecting the temperature of a generator 1 and performing the compensation of torque. As a result, the rotational speed, primarily the idling rotational speed of an engine is stabilized, and the fuel consumption of the engine can be improved.



LEGAL STATUS

[Date of request for examination] 19.07.2000

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration] withdrawal

[Date of final disposal for application] 24.04.2003

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of]

THIS PAGE BLANK (USPTO)

*** NOTICES ***

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] A battery A field winding with which electric power is supplied from this battery and a generation of electrical energy is presented A switching means to be connected to this field winding at a serial, and to energize or intercept field current A control unit which generates a signal which is installed out of a generator, detects voltage of said battery, responds to the voltage, and energizes or intercepts said switching means, and controls generation-of-electrical-energy voltage of said generator It is the charge power plant for vehicles equipped with the above, and said generation-of-electrical-energy armature-voltage control equipment is characterized by determining generation-of-electrical-energy voltage based on a temperature signal of a detected generator.

[Claim 2] It is the charge power plant for vehicles characterized by being obtained from a thermometric element with which a temperature signal of said generator is formed in a generator in claim 1 publication.

[Claim 3] A generator which generates an output for driving according to rotation of an engine and charging a battery A field winding with which electric power is supplied from said battery and a generation of electrical energy is presented A switching means to be connected to said field winding at a serial, and to energize or intercept field current A control unit which controls said engine's amount of fuel supply, and generates a signal which detects voltage of said battery, responds to the voltage, and energizes or intercepts said switching means, and controls generation-of-electrical-energy voltage of said generator It is the charge power plant for vehicles characterized by building in a thermometric element equipped with the above, and a thermometric element which detects temperature of said generator is formed, and it is characterized by said control unit amending the amount of fuel supply to said engine based on a temperature signal detected by an energization cutoff ratio and said thermometric element of an energization signal given to a switching means.

[Claim 4] It is the charge power plant for vehicles characterized by installing said thermometric element near said switching means in either claim 2 and 3 publications.

[Claim 5] It is the charge power plant for vehicles characterized by considering as a temperature signal of a generator with voltage which said thermometric element is inserted in a serial in either according to claim 2, 3, or 4 in an input circuit of said switching means, and is outputted to said switching means from said control unit.

[Translation done.]

THIS PAGE BLANK (USPTO)

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the charge power plant for vehicles which can perform certainly temperature compensation of the equipment which was applied to amelioration of the generation-of-electrical-energy network used for an automobile etc., especially incorporated the generation-of-electrical-energy control function into an engine's control unit.

[0002]

[Description of the Prior Art] How to control by the microcomputer which installed the generator out of the generator is stated to JP,1-39306,B etc. The temperature of a battery was detected and the amount of generations of electrical energy according to that temperature was made to generate by this method.

[0003]

[Problem(s) to be Solved by the Invention] However, with this conventional technology, the temperature-compensation method in case a microcomputer detects the mechanical load (driving torque) of a generator was not discussed. Have not grasped driving torque of a generator correctly, and its rotational frequency at the time of an injection and cutoff of electric loads, such as a headlight and an air-conditioner, having not been stable (at the time [Especially] of idle rotation), and having un-arranged like an engine failure depending on the case, although the mechanical load (driving torque) of a generator could change with the temperature of the generator itself and could detect loaded condition with the actuating signal of an electric load switch.

[0004] The temperature of a generator is detected exactly and the engine according to the driving torque of a generator is controlled by this invention, and stabilization of idle rotational speed is mainly attained and it aims at an engine's rotational speed and raising an engine's fuel consumption.

[0005]

[Means for Solving the Problem] A field winding with which electric power is supplied to this invention from a battery and this battery, and a generation of electrical energy is presented, A switching means to be connected to this field winding at a serial, and to energize or intercept field current, In a charge power plant for vehicles which consists of a control unit which generates a signal which is installed out of a generator, detects voltage of said battery, responds to the voltage, and energizes or intercepts said switching means, and controls generation-of-electrical-energy voltage of said generator Said generation-of-electrical-energy armature-voltage control equipment is attained by charge power plant for vehicles characterized by determining generation-of-electrical-energy voltage based on a temperature signal of a detected generator.

[0006] A temperature signal of said generator is preferably attained by charge power plant for vehicles characterized by being obtained from a thermometric element of this invention formed in a generator.

[0007] A generator which generates an output for driving this invention according to rotation of an engine, and charging a battery, A field winding with which electric power is supplied from said battery and a generation of electrical energy is presented, and a switching means to be connected to said field winding at a serial, and to energize or intercept field current, In a charge power plant for vehicles which consists of a control unit which controls said engine's amount of fuel supply, and generates a signal which detects voltage of said battery, responds to the voltage, and energizes or intercepts said switching means, and controls generation-of-electrical-energy voltage of said generator A thermometric element which detects temperature of said generator is formed. A charge power plant for vehicles characterized by building in a thermometric element characterized by amending the amount of fuel supply to said engine based on a temperature signal detected by an energization cutoff ratio and said thermometric element of an energization signal given to a switching means attains said control unit.

THIS PAGE BLANK (USPTO)

[0008] Said thermometric element is preferably attained by charge power plant for vehicles characterized by thing of this invention installed near said switching means.

[0009] Preferably, said thermometric element is inserted in a serial in an input circuit of said switching means, and is attained by charge power plant for vehicles characterized by considering as a temperature signal of a generator with voltage of this invention outputted to said switching means from said control unit.

[0010]

[Embodiment of the Invention] Drawing 2 explains one example of this invention from drawing 1. Drawing 1 is the circuit diagram of the generator for automobiles by this example, and a peripheral device.

[0011] 1 of drawing 1 is a generator driven with an engine (not shown), and consists of the power substrate 10, the armature windings 11a, 11b, and 11c which turn into three-phase-circuit Y connection, the rectifier 12 which changes the ac output of an armature winding 11 into a direct current, and the field winding 13 which supplies magnetic flux to armature windings 11a, 11b, and 11c. 2 is a battery and, as for the engine control system by which 3 controls a key switch and 4 controls an engine, the ISC bulb by which 41 controls idle speed, and 42, an ignition coil and 43 are ignition plugs. Although a part for a 1 cylinder was indicated about the ignition coil and the ignition plug, it has an ignition system for every gas columns, such as a 4-cylinder and 6-cylinder, in fact.

[0012] The interior of the power substrate 10 consists of the power transistor 101 by which Darlington connection was carried out, diodes 102a, 102b, 102c, 102d, and 102e which detect temperature, a power diode 103, and a resistor 104.

[0013] Furthermore, the interior of an engine control system 4 is shown in drawing 2. As for an output-buffer circuit and 409, the voltage stabilizer where 401,402 outputs a partial pressure resistor and 403 outputs the constant voltage of 5V, the A-D converter from which constant-voltage Rhine (Vcc) and 405 change an analog signal into a resistor, and 404 changes 406 into digital value, MPU to which 407 performs data processing, and 408 are [a transistor and 410,411] power transistors. Although actuation which an engine control system 4 controls the amount of fuel supply to an engine, controls ignition timing etc., and carries out electronics control of the engine synthetically is performed, in this example, only the circuit of the generation-of-electrical-energy control circumference is carried.

[0014] The generation-of-electrical-energy actuation by the above configuration is explained below. Drawing 3 expresses the flow chart of the portion in connection with the generator of an engine control system 4 in this example. The task about generation-of-electrical-energy control is performed with a fixed period (for example, 10msec(s)). If the task of armature-voltage control is started at step 301, it will move to step 302 and battery voltage Vs will be incorporated. The partial pressure of the voltage Vs of a battery 2 is carried out by the partial pressure resistor 401,402 of drawing 2 through a switch terminal, and it is changed into digital value by A-D converter 406. This voltage value is set to Vs and memorized. Next, the temperature VT of a generator is incorporated at step 303. Current is supplied to T terminal of a generator through a resistor 405 from constant-voltage Rhine Vcc of drawing 2. The diodes 102a-102e of a generator 1 carry out series connection of the five diodes, and change, and the voltage VT of T terminal is expressed with the following formulas.

[0015]

$$VT = 5, VF(T) (V) \text{ -- (1)}$$

Here, VF expresses the forward voltage of diode and has the following temperature characteristics as an example of the property.

[0016]

$$VF = 0.65 - 0.002 \cdot (T - 25) (V) \text{ -- (2)}$$

Here, it is the temperature (degree C) of T:diode. (2) Substitute a formula for (1) type. $VT = 3.25 - 0.01 \cdot (T - 25) (V) \text{ -- (3)}$
 *****. Temperature T is counted backward from obtained VT. $T = 0.01 \cdot (3.25 - VT) + 25 (\text{degree C}) \text{ -- (4)}$

It can be come out and found.

[0017] Next, the control voltage set point is calculated at step 304. The voltage which generally charges the mounted battery of a passenger car is -0.01v/degree C by the temperature of 14.4V and a generator at ordinary temperature (20 degrees C). It is optimal to perform temperature compensation. $V_{set} = 14.4 - 0.01 \cdot (T - 20) (V) \text{ -- (5)}$

***** is performed.

[0018] Control duty which should be outputted is calculated at the following step 305. Control duty is the control voltage set point Vset. Feedback control is performed so that the deflection of the actual battery voltage incorporation value Vs may be lost. In this example, PI (proportionality and integral) control is performed to deflection. $D = K1 \cdot +K2 \cdot \text{integral}(V_{set} - V_s) dt \text{ -- (6)}$

Here, K1 and K2 are proportionality and an integration constant, respectively.

[0019] The last D which the armature-voltage control task of drawing 3 calculated by the actual digital operation is set to Do, and it is a weighted mean. $D = C1 \cdot \text{and} (V_{set} - V_s) + C2 \cdot D_o \text{ -- (7)}$

THIS PAGE BLANK (USPTO)

If it calculates by the ** type, (7) types will become (6) types and equivalence.

[0020] (7) The duty calculated by the formula is transmitted to a transistor 409 at step 306. And the duty of a power transistor 101 is controlled through C terminal.

[0021] The field current which flows to a field winding 13 by the duty of a power transistor 101 changes, the voltage which this generates in an armature winding 11 changes, and the voltage of a battery 2 is influenced through a rectifier 12. Feedback control is carried out by the software stated above, and battery voltage V_s is control voltage V_{set} . It is adjusted. This control voltage V_{set} It is compensated with the temperature of the generator 1 interior, and it is set as the high voltage at the time of low temperature, and is set as a low battery at the time of an elevated temperature, and a battery 2 is charged.

[0022] Next, the task which amends idle rpm by drawing 4 is explained. If an idle amendment task is performed at a fixed gap by step 401, an engine speed N_e will be incorporated at step 402. N_e is calculated from the period of the pulse signal which the crank angle sensor 44 generates. At step 403, count which amends an air flow rate from electric load is carried out.

[0023] Torque T_d which drives a generator $T_d = A \cdot P_o \cdot \eta (N_g)$ (kgf-m) -- (8)

It is come out and expressed. It is here and is A. : Constant P_o : Output power of a generator (W)

$\eta (N_g)$: Effectiveness of a generator (it is dependent on rotational speed)

N_g : -- rotational speed of a generator (r/m) it is . Output power of a generator (W) $P_o = V_s \cdot I_o$ (W) -- (9)

I_o : The output current of a generator (A) It is expressed.

[0024] Furthermore, to field current I_F , the output current of a generator becomes settled uniquely by the magnetic circuit of a generator, and is expressed with the function which carries out the increment in monotone.

[0025]

$I_o = F(I_F, N_g)$ (A) -- (10) Here and field current I_F are expressed with the following formula to the duty D inputted from C terminal.

[0026]

$I_F = D \cdot (V_s - V_{cesat.}) / R_r (T)$ -- (11) However, $V_{cesat.}$: Voltage between collector emitters of a power transistor 101 (V)

$R_r (T)$: It is the resistance (ohm) of a field winding 13. $R_r (T) = R_{ro} + (T - 20) \cdot \gamma$ (ohm) -- (12) Resistance of the field winding 13 at the time of R_{ro} : 20 degree C (ohm)

γ : temperature coefficient of the resistance of a field winding 13 (ohm/degree C)

(9) If (12) types are substituted for (8) types from a formula $T_d = A \cdot V_s \cdot F(D \cdot (V_s - V_{cesat.}) / (R_{ro} + (T - 20) \cdot \gamma))$, N_g and $\eta (N_g)$ -- (8') It is obtained. (8') In a formula, it can ask from the rotational speed N_g of the generator calculated by the engine speed N_e incorporated at V_s incorporated at the duty D calculated at the drawing 3 step 305, and this step 302, the temperature T incorporated at this step 303, and step 402 of drawing 4 by multiplying by the speed ratio (usually effective diameter ratio of a pulley) of an engine and a generator.

[0027] In addition, A , $V_{cesat.}$, and R_{ro} and γ are beforehand memorized as a constant. Moreover, Functions $F(I_F, N_g)$ and $\eta (N_g)$ are dispersed as data of a generator proper.

[0028] The air content Q_o demanded from the torque value consumed with a generator is computable from an engine property. If the air content proportional to consumption torque generally is amended and it is made to increase, it will become possible to obtain the fixed engine speed.

[0029] In this example, by detecting the temperature of a generator and amending torque, it becomes possible to perform precise amendment and it can stabilize idle rotation of an engine. Thereby, the set point of an engine idle rotational speed can be made lower than before, and it contributes to lessening the improvement in fuel consumption, and the total amount of an exhaust gas injurious ingredient. The 2nd example of this invention is shown in drawing 5. 10 of drawing 5 is the object which replaced the power substrate 10 of drawing 1.

[0030] The interior of the power substrate 10 consists of the power transistor 101 by which Darlington connection was carried out, a transistor 105 which detects temperature, a power diode 103, and resistors 104, 106a and 106b.

[0031] Here, the circuit which consists of a transistor 105 and resistors 106a and 106b performs actuation equivalent to the diodes 102a, 102b, 102c, 102d, and 102e of drawing 1. If base current is made into zero noting that the current amplification factor of a transistor 105 is large enough, the voltage which pressured the voltage V_T of T terminal partially by resistor R_{106a} and R_{106b} will become equal to the voltage between base emitters of a transistor 105. $V_T \cdot R_{106a} / (R_{106a} + R_{106b}) = V_{BE}$ -- (13) It becomes. That is, when V_T is counted backward from (13) types, it is. $V_T = (R_{106a} + R_{106b}) / R_{106a} \cdot V_{BE}$ -- (14) It is possible by becoming and choosing the value of resistor R_{106a} and R_{106b} suitably to make it a larger value than V_{BE} . V_{BE} is equivalent to V_F (forward voltage of diode) of (1) type, and dependent on temperature. $R_{106a} = 1 \text{ kohm}$, and $k \text{ ohm}$, then $R_{106b} = 5$ (14) type $V_T = 6$, V_{BE} -- (14')

It becomes equivalent to the circuit of drawing 1 which carried out six-piece series connection of a next door and the

THIS PAGE BLANK (USPTO)

diode. Since a circuit equivalent to the 1st example can be constituted from few elements in this example, there is an effect on economy.

[0032] The 3rd example of this invention is shown in drawing 6 and drawing 7. In the circuitry of drawing 6, C terminal and T terminal are unified as compared with the circuit diagram of drawing 1, and it is considering as T terminal. Drawing 7 shows the internal circuitry of the engine control system 4 of drawing 6. In drawing 7, C terminal is omitted and the collector of a transistor 409 is connected to T terminal. According to this example, the base current of a power transistor 101 flows through a resistor 104 and Diodes 102e, 102d, 102c, 102b, and 102a from an ignition switch terminal. For T terminal, the voltage of (3) types occurs according to this base current. However, when a transistor 409 is in switch-on, T terminal voltage is stopped by the saturation voltage between collector emitters of a transistor 409 (it is usually 0.1 V following), and turns into voltage unrelated to temperature T. Therefore, when incorporating the voltage of T terminal in an A-D converter, a transistor 409 needs to be in a cut off state. Then, in step 303 of drawing 3, the data incorporated while outputting the continuity signal to the transistor 409 is good to ignore as an invalid data. The temperature of a generator does not change rapidly and does not need to be incorporated for every armature-voltage control task of 10msec.

[0033] According to this example, it is possible to reduce one [at a time] the terminal of a generator 1 and an engine control system 4, and economical efficiency becomes still better.

[0034] The 4th example of this invention is shown in drawing 8. 10 of drawing 8 is the object which replaced the power substrate 10 of drawing 6.

[0035] The interior of the power substrate 10 consists of the power transistor 101 by which Darlington connection was carried out, a transistor 105 which detects temperature, a power diode 103, and resistors 104, 106a and 106b. This example is the object which combined the 2nd example and 3rd example, it is reducing the number of terminals while it reduces the number of diode, and it has become the combination from which the optimum on economy is acquired.

[0036]

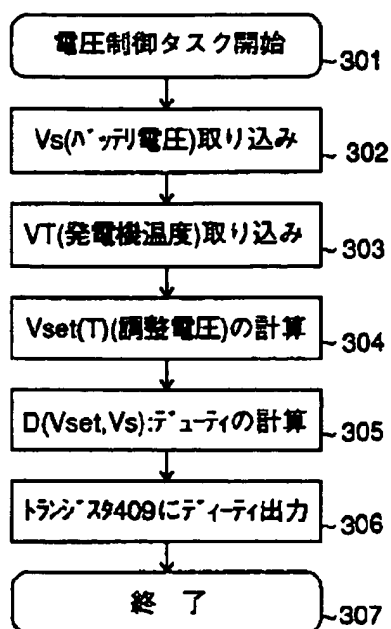
[Effect of the Invention] The temperature of a generator is detected exactly and the engine according to the driving torque of a generator is controlled by this invention, and stabilization of idle rotational speed is mainly attained and it becomes possible an engine's rotational speed and to raise an engine's fuel consumption.

[Translation done.]

THIS PAGE BLANK (USPTO)

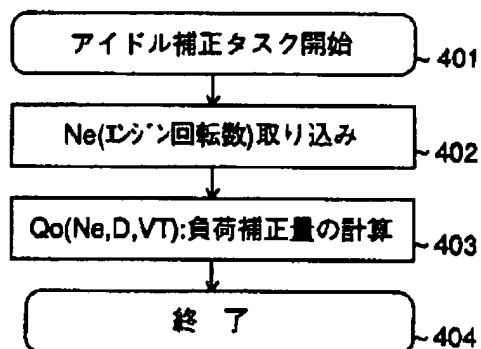
THIS PAGE BLANK (USPTO)

図 3

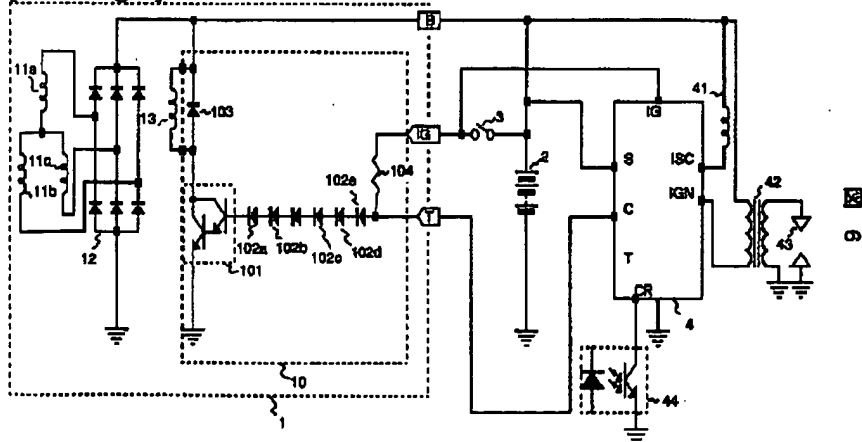


[Drawing 4]

図 4



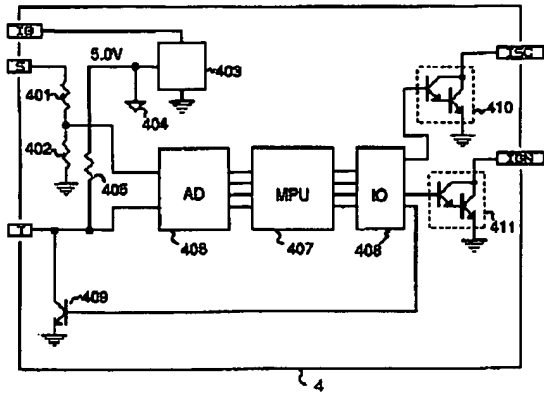
[Drawing 6]



[Drawing 7]

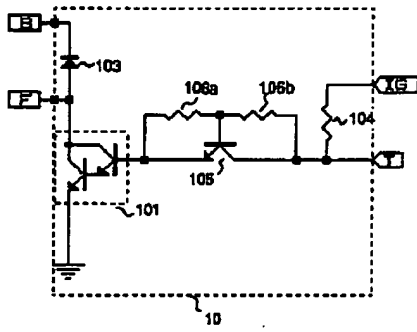
THIS PAGE BLANK (USPTO)

図 7



[Drawing 8]

図 8



[Translation done.]

THIS PAGE BLANK (USPTO)